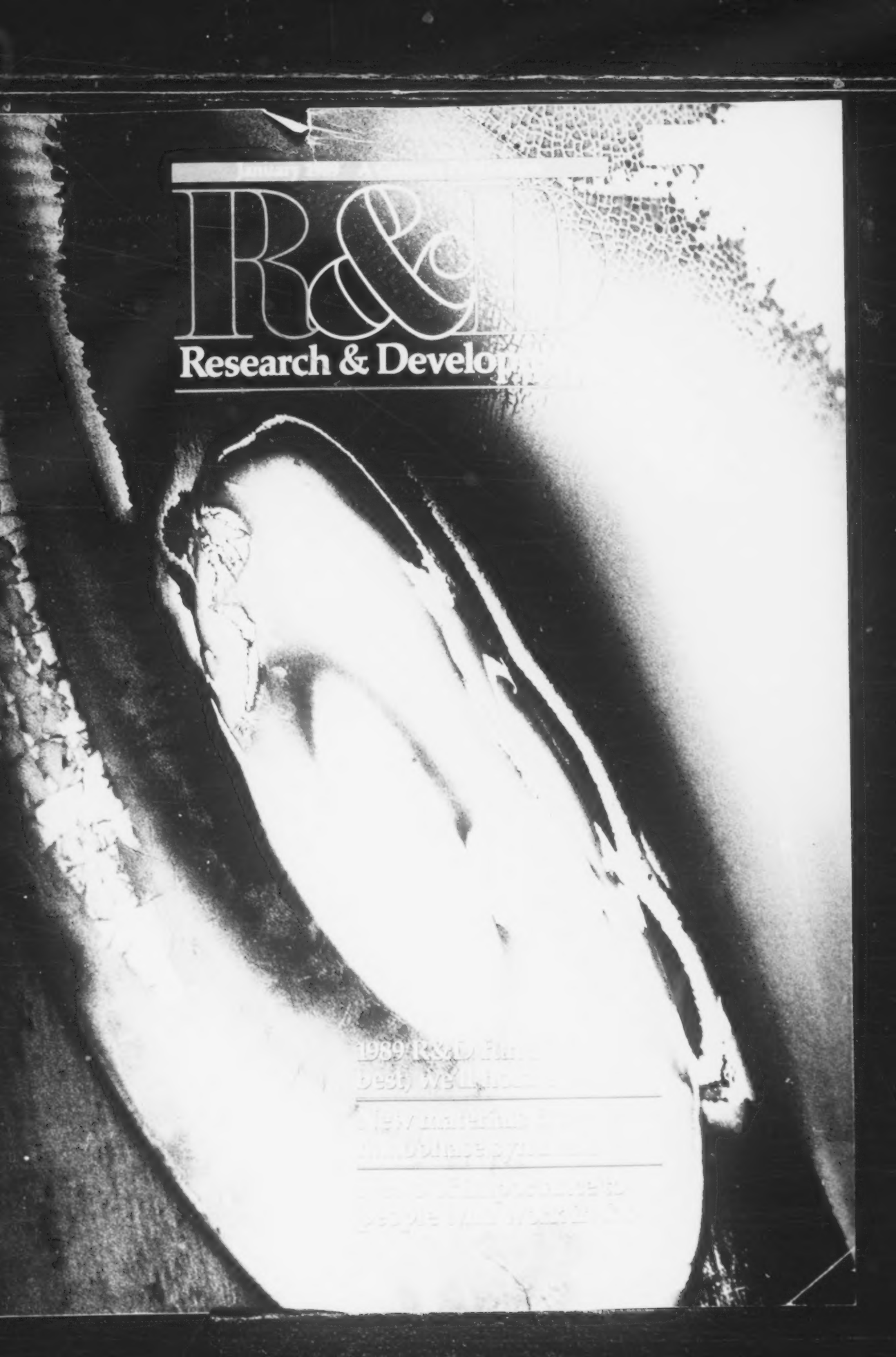
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R&D

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Research Funding for 1989 Won't Even Reach $131 Billion

The downturn in R&D's rate of growth that started in 1986 has taken its toll on this year's research spending.

*By **Robert Cassidy**, Senior Editor, Business, R&D magazine*

A FUNNY THING happened on the way to 1989: The bottom dropped out of R&D funding growth. The open spigot that poured out double-digit spending surges in the early 1980s seems to have been shut off about 1986, apparently more tightly than anyone thought.

For the past three years or so, in fact, the real total of dollars spent nationwide on R&D has been significantly less than was forecast.

The result: R&D funding, which was supposed to have hit $132 billion in 1988, fell well short of that mark and likely will not reach it even this year. The best that can be expected for 1989 is total R&D funding of less than $131 billion. What happened?

Unexpected drop

Around 1986, the rate of growth in R&D funding apparently started tapering off, throwing off the projections from *R&D* magazine and the National Science Foundation (NSF).

For calendar year 1987, *R&D* magazine projected funds for research and development of $125 billion. Later, we downgraded that prediction to $123.6 billion.

Based on recent information from government sources, it is more likely that the 1987 figure was closer to $118 billion. That's a difference of 4.5% from our revised prediction.

A year ago, we said R&D funding would hit $132 billion in 1988, an increase of 6.8% over our revised 1987 prediction of $123.6. Later, we reduced our 1988 forecast slightly to put it in line with NSF's forecast, to $131.6 billion, a 6.5% increase over our revised '87 prediction.

Due to the lower base and the declining rate of change, however, the 1988 dollar figure probably also was too high, although the rate of change was reasonably accurate. The best available figure for 1988 R&D funding is $125 billion, a 5.9% increase over the probable 1987 total of $118 billion.

For 1989, *R&D* magazine projects funding of $130.8 billion for research and development, a 4.6% increase over the revised 1988 figure. In constant dollars, that means real R&D funding will decline (if you use the Cahners Economics Dept. figure of 5.0% for the Consumer Price Index) or will grow slightly (if you use the Office of Management & Budget's figure of 3.9% for 1989).

Industry will contribute $64.1 billion (49.0%) of that total, with the Federal government kicking in $61.1 billion (46.7%), and universities, colleges, and other nonprofit organizations adding $5.6 billion (4.3%). That's a drop of nearly two percentage points in the Federal portion and a nearly one-point boost in the university-nonprofit sector.

Once again, industry will actually carry out the bulk of the research, $93.8 billion worth (71.7%), a one-point drop in the portion it usually performs. Federal laboratories will conduct $14.8 billion in research (11.3%), also about a point less than their usual share. The universities and nonprofit organizations will perform $22.2 billion (17.0%)—a nearly two-point increase in that sector's "share of market," a trend we noted last year.

"The mix is changing a little," says Dr. Joseph Saloom, senior vice president of M/A Com Components Inc., Burlington, MA. "Industry is funding a lot more joint ventures with universities, so somewhat more of the research is actually being done at the universities."

Economy flattening

From industry's point of view, the slide in R&D growth can be explained in one phrase: slower economic growth. As Cahners senior economist Madeline Franchi explains in the accompanying story, the six-year run-up of sales and profits that fueled R&D growth earlier in the decade definitely has tapered off.

Franchi predicts a mild letdown, with the GNP up just 2% in 1989, compared to the 4% annual growth we've been seeing. In fact, GNP growth in the third quarter of 1988 (the most recent available figure) was 2.2%. Slower economic growth usually means less growth in R&D.

"I don't get the feeling that there's going to be any kind of big splurge," says Dr. Jules Blake, vice president of research at Colgate-Palmolive.

There were other signs that R&D spending was in trouble:

• In its "R&D Scoreboard" last June, here's how *Business Week* described the "perilous cutback" in research spending:

"With the U.S. under escalating pressure from competitors, an R&D slowdown couldn't happen at a worse time," the magazine said. "But a wave of corporate restructuring and a continuing emphasis on short-term profits are pushing R&D spending back into the doldrums of the mid-1970s. Without question, R&D's days as a

One theory holds that mergers and acquisitions have a chilling effect, forcing management to cut research budgets.

sacred cow are over for now."

• An *R&D* magazine poll of CEOs at the U.S.'s 476 largest industrial companies revealed that most of the firms' R&D budgets would not be growing as fast in the next three years as they had in the previous three years.

• The Industrial Research Institute, in a survey of 161 R&D directors, found that R&D funding as a percentage of sales will drop from 3.1% in 1988 to 3.0% in 1989.

Gobbling up 'Velveeta'

As 1988 drew to a close, mergers and acquisitions continued to animate the corporate world, most recently the food sector. Pillsbury and RJR Nabisco were put in play. Kraft, the biggest R&D spender in the food business (nearly $63 million in 1987), was purchased by Philip Morris's General Foods division last October for $12.9 billion.

General Foods management said it anticipated no major changes for the merged companies, but those kinds of promises can't always be kept. "When we sold our Kendall paper division, the new ownership put the R&D director out of a job," says Colgate-Palmolive's Blake.

There are two schools of thought about the effect of takeovers on R&D spending. No one yet knows which is correct.

One theory holds that the threat of a takeover is usually so nebulous that most companies (and their research departments) go right on with business as usual until confronted with a real threat.

The other, more popular, theory holds that takeovers have a chilling effect, forcing management to trim research budgets in order to inflate the stock price and deflect unfriendly suitors.

Whether the Bush Administration will propose controls on takeovers, such as eliminating the deductibility of interest in leveraged buyouts, remains to be seen.

Looking closely at key industry groups, biotechnology firms will almost surely have to continue to spend high proportions of revenues on R&D. But diversified chemical companies like Du Pont and Monsanto, which have poured millions into biotech in recent years, may have to retrench on their investment, as the rewards of biotechnology research appear to be slower in coming than had been hoped for.

In the chemicals field, "companies will be spending on anything to do with new high-performance materials—plastics, ceramics, separations," says Frederick Levitt, director of government science relations for Dow Chemical. Composites, especially for the automobile industry, also are hot, he says.

Industrial machinery and electronics may be a little weaker in '89, Franchi notes, but the slowdown should be short-lived.

Certain industries, notably petroleum, have been paralyzed by global

As the economy slows, so will R&D growth

FOR MANY INDUSTRIES, R&D funds as a percentage of net sales have been fairly consistent over the past few years. As sales and profits go, so does R&D spending. A notable exception: the electronics industry, where the need to keep up with fast-breaking technology has required that extra capital be devoted to R&D.

Since revenues generally follow the ups and downs of the economy, you will want to watch certain key indicators within the larger economic picture that can influence your R&D staffing and equipment budget.

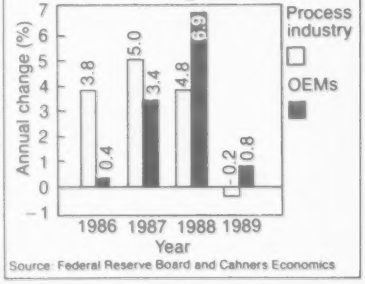
The Cahners Economics look ahead: slow going, but no big bust.

Cooling down

After a six-year run, the economy is set for a relatively short and mild cooling-off period in 1989. The outlook includes a minor decline in GNP in the middle two quarters of the year, with the economy edging up to 2% growth for the year. That is below the 4% pace we've been seeing in recent years, but it is hardly a long-term recession.

Part of the slowdown is due to the flattening of purchases of durable goods by consumers. More fundamentally, the reversal can be attributed to the very sectors that prompted a faster pace of growth earlier in 1988—namely, trade and business investments in plant and equipment.

Process and OEM industries' production



Source: Federal Reserve Board and Cahners Economics

With a flame under the country's economy in 1988, utilization of current manufacturing capacity increased. Manufacturers got busy adding new capacity and modernizing existing facilities. Total spending for new plants and equipment soared 11.3% in 1988, to $162.3 billion.

The process industries, in particular, geared up to take advantage of the renewed domestic and foreign demand for their products.

However, spending on new plant and equipment will flatten in 1989. Total spending will decline to $161.1 billion this year, with most industries edging downward. The paper, petroleum, fabricated metals, motor vehicle, and aircraft industries are forecast to make small increases in their expenditures.

To understand what is happening, take a look at the process industries.

In 1988, the market for industrial materials experienced spot shortages and higher prices. Plant capacity utilization rates were exceptionally high in the process industries, and Cahners lead-times index (an index of average delivery times for 100 industrial materials) reached levels not seen since 1985.

Although tight supplies are typical toward the end of an economic expansion, supply bottlenecks were made worse by increased foreign demand for U.S. industrial materials and by domestic economic strength in the wake of 1987's stock market crash.

economics. With crude at $12.50 a barrel in Texas, says Amoco Oil's R&D director, Dr. Keith McHenry, "nobody's going to be spending a lot on R&D in our business."

Washington cautious

According to sources who monitor Congressional appropriations, real R&D funding through Sept. 30, 1989, looks something like this:

Defense, $37.742 billion; National Institutes of Health, $7.152 billion; NASA, $4.192 billion (not counting certain operational costs for the space shuttle); DOE, $6.179 billion; NSF, $1.885 billion; Agriculture, $1.064 billion; and the National Institute of Standards & Technology (NIST, formerly NBS), $159 million.

In addition, it is estimated that Interior got about $396 million in R&D funds; Environmental Protection Agency, $335 million; Transportation, $317 million; and the National Oceanic & Atmospheric Administration, $176 million.

Gramm-Rudman will force Congress to reduce the budget deficit to $108 billion, even though OMB projects a $146-billion shortfall. If further cuts are required, they could come out of unprotected R&D appropriations.

Cutbacks in defense R&D are likely to ripple through the technology-based sectors of the economy. Congressional leaders on both sides of the aisle held fairly closely to the 3.0% increase agreed to at the December 1987 budget summit brought on by Gramm-Rudman-Hollings budget limits. Even the Strategic Defense Initiative got $800 million less than President Reagan requested.

"The research accounts in the defense budget took a real beating," says Ed McGaffigan, an aide to Sen. Jeff Bingaman (D-NM), member of the Senate Armed Services Committee. "They're not talking about major force reductions overseas, so if you don't cut people, you have to cut R&D."

The defense portion of DOE also faces trying times in 1989. A draft report leaked last October to *The Wall Street Journal* calls for the closing of nuclear-weapons facilities at Fernald, OH, and Rocky Flats, CO, and the streamlining of operations at three other sites. The cost to clean up these locations could run as high as $100 billion, says McGaffigan.

No big jumps

Appropriations for nondefense R&D spending tracked the budget requests, says John Crowley, vice president of the American Assn. of Universities in Washington. Funding levels generally were "flat," he says, adding that "certainly there were no dramatic jumps" across the board.

There were exceptions, however. Sematech, the semiconductor industry manufacturing consortium, remains untouchable because it combines competitiveness with defense. Congressional aide McGaffigan predicts that Sematech will get $500 million over a five-year period, "no matter what the President requests."

A new "competitiveness" program, NSF's Science and Technology Centers, got $25 million for FY89, enough to start perhaps 10 to 12 interdisciplinary centers. However, Congress refused to give NSF director Erich Bloch a five-year, $150-million commitment to the program.

Other popular projects managed to evade the budget ax. Congress has awarded NIH, one of its pet agencies, nearly $600,000 more than the amount requested by President Reagan for AIDS research—about a 30% increase.

Boost for NASA

NASA also came up with about a 30% increase in its budget, some $900 million of it going toward the manned space station. However, $515 million of that appropriation will have to be approved by the new President in May—and, given other budgetary concerns, it's not at all certain full funding will survive.

At the "nonweapons" Federal labs, "things look about the same," says Alan Schriesheim, director of Argonne (IL) National Lab. "We didn't get as much as we wanted for superconductivity research (a total of about $10 to 12 million)," he says. But Argonne, Los Alamos, and Oak Ridge will get $2 million each this year to foster superconductivity research be-

However, it became evident that the process industries were beginning to weaken at the end of 1988. Growth in shipments for paper, petroleum, and stone, clay, and glass products hit their high points in the third quarter of 1988, and inventory levels rose. As the economy stumbles this year, processors of industrial materials will be cutting back on output.

Overall, output for the process industries will fall by just 0.1% in 1989. Growth in output of primary metals and stone, clay, and glass products will inch up slightly. Toward the end of the year growth for chemicals, paper, rubber, and plastics products will slide into the negative zone.

Some silver linings

This sag will squeeze R&D budgets in these industries. On the bright side, however, the impending downturn in the process industries will check the price spiral in industrial materials and reduce delivery times. So look for stabilizing or somewhat lower prices and a ready supply of many of the industrial materials you need to buy for your lab.

Industrial production from the original equipment manufacturers (OEMs) advanced about 7% in 1988. Nonelectrical machinery (in which the government includes computers and office equipment), fabricated metals, and instruments made strong output gains last year. Strong export markets and healthy domestic investment fueled OEM production in '88.

But the picture will change this year. Export growth won't be as robust, and business investment in equipment will be weak in 1989. Growth in OEM production will slow to a crawl in most sectors. The slowdown will be short-lived however, as industrial machinery and electronics industries regain strength in 1990.

Most likely, industrial funds for R&D will increase this year, but the rate of growth will be a trickle compared to the hikes we saw earlier in the decade.

Because the electronics industry has a lot riding on commercializing new technology and reducing product development cycles, expect some measure of real growth in R&D budgets for component, computer, and instrument manufacturers as they devote a larger percentage of annual sales to the R&D function.

—Madeline Franchi
Cahners Economics Dept.

Having a new President in the White House doesn't mean that science and technology issues will get priority.

tween the Federal labs and industry.

The $4.4-billion superconducting super collider got a lift with the choice of Texas, home of President-elect Bush and House speaker Jim Wright, as the site. But SSC funding is still vulnerable, now that legislators from the 49 other states won't be feeding at the trough.

"It's such a combination of politics and science," says Argonne's Schriesheim. "You've got a small group of high-energy physicists up against the rest of the nation's scientists, and a Democratic Congress against a Republican President."

Nor is Washington throwing money at NIST, even though the 1988 trade bill suggests that the agency become a "civilian DARPA"—the Defense Advanced Research Projects Agency.

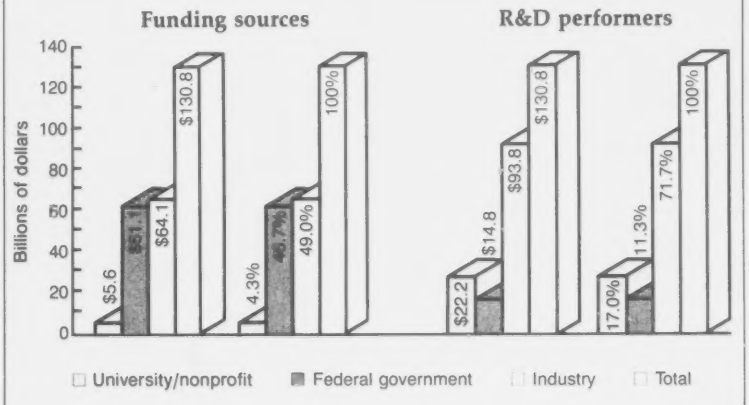
"Congress has given NIST a great deal of authorization and no money," says Lee W. Rivers, Washington representative for the Federal Laboratory Consortium (FLC).

Another policy change has to do with how Federal dollars are being dispensed to universities. "It used to be mostly outright grants for capital equipment," notes a spokesman for the Scientific Apparatus Makers Assn. in Washington. "Now, if you need a piece of equipment that's part of an approved project, you get it."

Looking ahead, 1990 looks as meager as '89. In the private sector, the general economic slowdown points to continued sluggishness in R&D spending growth for the early '90s.

One area that offers hope is technology transfer. "There does seem to be a sincere effort to try to market the know-how of the Federal labs," says Dow's Levitt. He says the pharmaceuticals industry is pushing NIH to release more of its research. "There's got to be something in there for industry," he says.

Who will supply, spend 1989 R&D dollars?



The Federal government and private industry will share most of the research costs in the U.S. in 1989, with industry carrying out the bulk of the work.

Breaking new ground

Another breakthrough came in the form of an invitation from Secretary of Energy John S. Herrington to 50 CEOs of R&D-based companies. The purpose of last December's scheduled meeting was to talk about the real problems of transferring technology from Federal labs to industry. "DOE is coming around on tech transfer," says Levitt.

At the Federal level, the election of a new President does mean that R&D interest groups will have "a new group of players to tell their story to," says Levitt.

But, he is quick to add, when you consider the more-pressing issues that the new Administration will have to tackle—the budget deficit, the trade imbalance, the savings-and-loan bailout, to name a few—"science and technology's concerns do not have that kind of immediacy."

So you've been warned: Don't count on any windfalls. **R&D**

R&D tax credit gets another year of life

ONE BRIGHT SPOT for industrial research in 1989 is the one-year renewal of the 20% R&D tax credit, which provides a dollar-for-dollar reduction of taxes to companies for increases in their R&D budgets.

"That's good R&D, because it's occurring at the marketplace," says Joseph Saloom, chairman of the Council on Research & Technology, which lobbied Congress for the renewal.

The credit has been responsible for adding $4 to $5 billion in new R&D since 1981, says Brookings Institution senior fellow Martin N. Baily. Because the credit is based on a rolling three-year average of a company's R&D spending, however, the firm must spend more each year to get the benefit.

As a result, says Baily, the credit will probably produce only about $1 billion in "new" R&D funding by industry. Congress failed to approve a lesser tax break for companies that had earned the credit in the past but which could not put in additional new money in 1989.

"The pressure from [Ways & Means Committee Chairman Dan] Rostenkowski is so great to cut back on revenue losses, but I think that's a serious mistake," says economist Baily. "It's a nickel-and-dime part of the Federal budget, and most studies suggest that R&D is necessary to maintain our competitiveness." □

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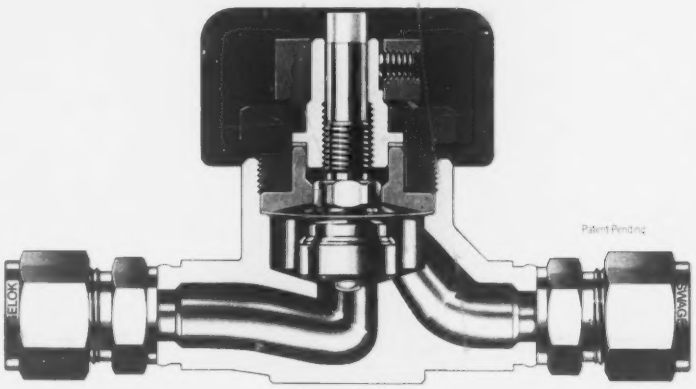

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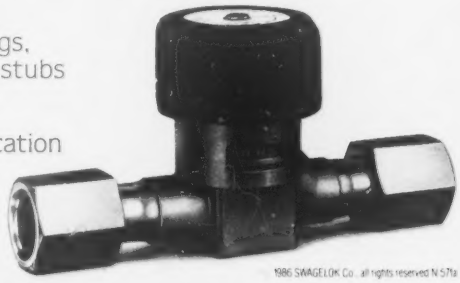

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